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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/676,336	10/01/2003	Hong-Ki Kim	8836-199 (IB12118-US)	6515

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EXAMINER	
DOTY, HEATHER ANNE	
ART UNIT	**PAPER NUMBER**
2813	

DATE MAILED: 08/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/676,336	KIM ET AL.
	Examiner	Art Unit
	Heather A. Doty	2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 June 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1-6* is/are allowed.

6)☒ Claim(s) *7 and 9-11* is/are rejected.

7)☒ Claim(s) *8* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless – (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 7 is rejected under 35 U.S.C. 102(e) as being anticipated by Park et al. (U.S. 2004/0009662).

Regarding claim 7, Park et al. teaches a method of forming a semiconductor device comprising sequentially forming a supporting layer (**100** in Fig. 1a supports sacrificial layer **101**) and a sacrificial layer (**101** in Fig. 1a) over a semiconductor substrate (**110** in Fig. 1a); forming an opening by patterning the sacrificial layer and the supporting layer (Fig. 1c); and removing the sacrificial layer by a wet etch process, wherein the sacrificial layer is formed of a material that has a faster wet etch rate than the supporting layer, and the supporting layer comprises a single layer (Fig. 1d; paragraph 0021).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (U.S. 2004/0009662) in view of Kung (U.S. 5,504,026).

Regarding claims 10 and 11, Park et al. teaches the method as claimed in claim 7, but does not teach that the sacrificial layer includes HSQ, BPSG, or PSG, or that the wet etch is performed by using an HF solution (Park et al. does not specify a preferred wet etch chemistry).

Kung et al. teaches making a sacrificial layer that is easily removed later in the process by forming the layer of a material that includes BPSG or PSG (column 4, lines 5-9). Kung et al. further teaches removing this sacrificial layer using a wet HF etch (column 4, lines 1-4).

Therefore, at the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the teachings of Park et al. and Kung by manufacturing a semiconductor device according to the method taught by Park et al. and claim 7, and further fabricating the sacrificial layer of a material including PSG or BPSG, and then using a wet HF etch to remove it, as taught by Kung. The motivation for doing so at the time of the invention would have been to choose a material and subsequent etch that provided an easy method of removing the sacrificial layer, as expressly taught by Kung.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (U.S. 2004/0009662) in view of Wolf et al. (*Silicon Processing for the VLSI Era*, volume 1).

Regarding claim 9, Park et al. teaches the method as claimed in claim 7, but does not teach that the supporting layer includes a PETEOS oxide or an HDP oxide.

Wolf et al. teaches that silicon oxide deposited from plasma-enhanced TEOS (PETEOS) produces high-quality films at low temperatures, which is advantageous in processes involving multilevel-metal technologies (pg. 193, section 6.4.1.3).

Therefore, at the time of the invention, it would have been obvious to form the supporting oxide layer taught by Park et al. by depositing it using a PETEOS chemistry. The motivation for doing so at the time of the invention would have been to deposit the layer at low temperatures, as expressly taught by Wolf et al.

Allowable Subject Matter

Claims 1-6 are allowed.

Claim 8 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Prior art does not teach or suggest, in combination with the other claimed limitations, a method of forming a semiconductor device comprising sequentially forming a supporting layer and a sacrificial layer over a semiconductor substrate, forming an opening in the sacrificial and supporting layers, forming a bottom electrode covering the inner wall and the bottom of the opening, removing the sacrificial layer, and forming a dielectric layer and an upper electrode on the bottom electrode and the supporting layer, wherein the supporting layer comprises a single layer.

Furthermore, prior art does not teach or suggest, in combination with the other claimed limitations, sequentially forming a supporting layer and a sacrificial layer over a semiconductor substrate, forming an opening in the sacrificial and supporting layers, wherein the supporting layer comprises a single layer, and further forming a dielectric layer over the supporting layer, patterning the dielectric layer and the supporting layer to form a contact hole, and filling the contact hole with a conductive material to form a contact plug. Park et al. (U.S. 2004/0009662, see 35 U.S.C. 102(e) rejection above) anticipates claim 7, but there is no motivation to combine this reference with other

relevant prior art to form a dielectric layer over the supporting layer, pattern the dielectric and supporting layers to form a contact hole, and fill the contact hole with a conductive material to form a contact plug.

Response to Arguments

Applicant's arguments with respect to claims 7 and 9-11 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Heather A. Doty, whose telephone number is 571-272-8429. The examiner can normally be reached on M-F, 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached at 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

had

LAURA M. SCHILLINGER
PRIMARY EXAMINER